CS4226 Programming Assignment Report

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Setup

Uses the default mininet VM downloaded from the mininet website.

mininetTopo.py

Requires the file `topology.in` to be in the same folder together. Run the command `sudo python mininetTopo.py` to launch. Ensure POX is running first.

Creates hosts, switches and links based on `topology.in`. Stores link configurations for use in QoS queue creation.

Creates QoS queues based on link configurations. Identifies the link and creates the default queue based on specified link bandwidth. VPN and non-VPN queues are created with 100Mbps and 50Mbps bandwidth respectively, as per the instructions.

controller.py

Requires the file `policy.in` to be in the `~/pox` folder. Run the command `./pox.py log.level --DEBUG pox.misc.controller` in the `~/pox` folder to launch. Run this before launching mininet.

Reads `policy.in` during `_handle_ConnectionUp()`. Parses firewall policies and creates flow rules to send to the switch that raised the `ConnectionUp` event. Flow rules account for both directions of TCP traffic and only blocks TCP traffic as per the instructions. ARP messages can still go through.

Parses VPN policies and stores them in a dictionary for later use during switch operation.

Stores each switch's MAC address table in a dictionary. High level algorithm for packet forwarding is as follows:

1. Store the MAC address and port number in the switch's own MAC address table
2. Get source and destination IP address if possible
3. Identify the appropriate queue based on VPN policies in switch's VPN dictionary
4. If destination MAC is multicast, flood the packet without writing any rules
5. Else if exit port is unknown, flood the packet without writing any rules
6. Else get the exit port and write flow rule to enqueue on previously identified queue

Firewall rules have higher priority than VPN rules to ensure TCP traffic remains blocked.

Observations

Network speed seldom goes above 100Mbps, even for VPN-guaranteed bandwidth. This may be due to slow processing time of switches and controller on the VM.

Addendum

Code and README can be found at https://github.com/nicholaslum444/cs4226-mininet.